KRONOSAURUS QUEENSLANDICUS.

A GIGANTIC CRETACEOUS PLIOSAUR.

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(Text-figures 1 5.)

In 1924 a new gigantic marine reptile from the Queensland Cretaceous was described by the writer under the name *Kronosaurus queenslandicus*.[1] The type material consisted of a fragment of a very massive sauropterygian mandible, symphyseal region, with the remains, largely alveolar, of six very large thecodont teeth. These teeth had a maximum diameter of 40 mm., and it was suggested that they attained at least 250 mm. in total height, being comparable with those of *Pliosaurus grandis*. This fragment was forwarded from Hughenden, Central-western Queensland, by Mr. Andrew Crombie in 1899.

It is pleasing to be able to record that, through the kindly interest and enthusiasm of Mr. H. A Craig, Mr. W. Charles, Head Teacher of the Hughenden State School, and Mr. N. E. Anderson, additional material of this marine reptile has been found. This was discovered in August, 1929, by these three gentlemen near a locality in which Mr. Charles had previously found fossils "two miles south of Hughenden." In all fifteen fragments were forwarded, but some of these were small specimens that were so much abraded that none of the original contours were preserved. The two largest fragments consisted of the proximal ends with portions of shafts of two long bones, which are of outstanding significance, as they apparently represent the largest marine reptile yet recorded. As will be seen, the dimensions of the preserved portions are in excess of the corresponding measurements for *Megalneusaurus rex* (Knight)[2] from Jurassic beds, Wyoming, America, previously regarded as the largest known Pliosaur, first described as *Cimoliosaurus rex*.[3]

When the type of *Kronosaurus* was described it was realised that it represented a gigantic form, and although these later fragments from Hughenden are disappointing in their state of preservation they add much to our knowledge of this Cretaceous Pliosaur, especially in regard to its dimensions, although mere size is not, of course, an index to importance.

Note.—In Greek mythology Kronos, son of Uranos, swallowed his first five children, lest they should live to depose him. The sixth child, Zeus, was saved by his mother, Rhea, and ultimately deposed his father from the Olympian throne.—A. S. Murray's "Manual of Mythology."

[1] 1924: H. A. Longman, Mem. Qld. Mus., viii, pp. 26-28.

[2] 1895: W. C. Knight, Amer. Journ. Sci., 4th ser., vol. v, p. 378.

[3] 1895: W. C. Knight, "Science," vol. ii (n.s.), p. 449.

In this connection, however, it is of interest to quote the words of Dr. F. W. Whitehouse in regard to our Ammonites in the Family Aconeceratidæ: "The outstanding feature of these Australian forms is their enormous size. Each species is represented by individuals far larger than any known member of the family in the other continents."[4]

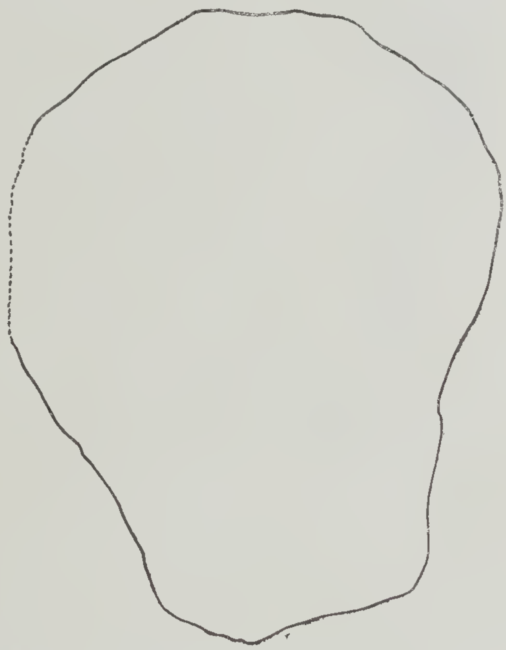
Text-figure 1.—*Kronosaurus queenslandicus*. Fragment of Left Humerus, Postero-external view, with massive trochanteric buttress. (Approximately ¼ natural size.)

Cratochelone berneyi, a giant turtle described by the writer in 1915, is also an exceptionally large form, and it is suggested that the probable

[4] 1927: F. W. Whitehouse, Mem. Qld. Mus., ix, pt. 1, p. 113.

mediterranean nature of our ancient Cretaceous sea was suitable for the development of a few megalomorphic species, perhaps owing to lack of competition. There is an alternative suggestion that these forms were approaching extinction, a phase which is often associated with megalomorphism.

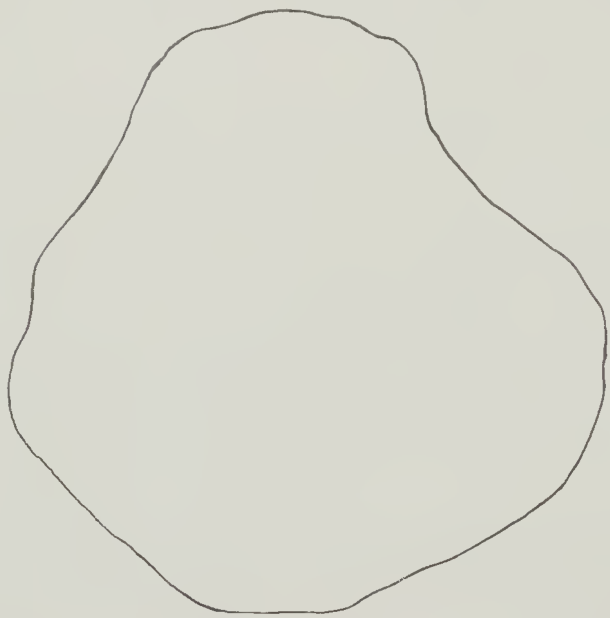
In addition to these long bones, there is a fragment of the proximal end of a mandible, an incomplete centrum and two distal fragments of a long bone, but these are too abraded to yield much evidence.



Text-figure 2.—*Kronosaurus queenslandicus.* Section through abraded head and trochanteric buttress of Left Humerus.

The incomplete limb-bones have evidently been subjected to colossal strains. In the first place, the fracture of the massive cylindrical shafts, which, when unabraded, attained at least eight inches in diameter, must have been the result of tremendous pressure. Apart from the fractures, the areas of abrasion are very considerable, and in the longer specimen much of the articular surface of the head has been lost. When the two bones are placed in juxtaposition, however, making due allowance for abrasion, there is so much similarity between the contours of the articular surface and the buttress for the attachment of muscles that they have been interpreted as right and left humeri. In view of their incompleteness, and also of the lack of outstanding distinctions between the femora and humeri of these paddle-limbed reptiles, the possibility of an error is here recorded, and additional material may show that one or both of these fragments may be femora.

Text-figure 3.—*Kronosaurus queenslandicus.* Fragment of Right Humerus; inner aspect. (Approximately $\frac{1}{4}$ natural size.)



Text-figure 4.—*Kronosaurus queenslandicus.* Section through abraded head and trochanteric buttress of Right Humerus.

As long ago as 1871[5] John Phillips pointed out that isolated femora and humeri were not always easy to distinguish. With a complete bone, distinctive diagnosis is usually gained from the contours of the distal region.

Dimensions of fragments:—

Left humerus, 480 mm. in length to fracture.

Maximum antero-posterior diameter of head (very incomplete), 234 mm.

Maximum diameter across head and trochanteric buttress (abraded), 292 mm.

Diameter of shaft, taken ten inches from proximal surface, 200 mm.; circumference, 585 mm.

The contour of the shaft near the region of fracture is somewhat oval, indicating the usual compression of the distal region.

Right humerus, 340 mm. in length to fracture.

Maximum antero-posterior diameter of head (abraded), 281 mm.

Maximum diameter across head and trochanteric buttress, 275 mm.

Owing to the differential abrasion the diameters of the head are markedly different in the two specimens, but this is obviously due to bad preservation. In the second or shorter fragment the antero-posterior contours of the head appear to be almost complete, and the maximum diameter is 281.

In so far as comparisons may be made, the measurements of the long bones of *Kronosaurus queenslandicus* slightly exceed those tabulated for *Megalneusaurus rex* by Knight (*loc. cit.*). The length of the complete humerus of the Wyoming specimen was 991 mm., and if the robustness of the Hughenden limb-bones was also reflected in their length the complete bone of *Kronosaurus* exceeded a metre.

In these Hughenden bones the convex articular surfaces slope outwards and downwards towards the massive buttress of the trochanter, which is centrally situated on the main axis of the bone and forms a projecting ridge. The contours are shown in Text-figures 1 to 4, but it should be emphasized that, owing to prolonged abrasion, the dorso-ventral diameter of the head in the longer specimen, or left humerus, is considerably greater than that of the convex articular surface in its antero-posterior extent. In the shorter specimen, or right humerus, where the abrasion has been more uniform, the two diameters are subequal.

When viewed from above the massive trochanteric process is almost quadrangular, owing to the pronounced projection of its upper part, below which it slopes sharply away on the external surface, subsiding into the sub-circular shaft.

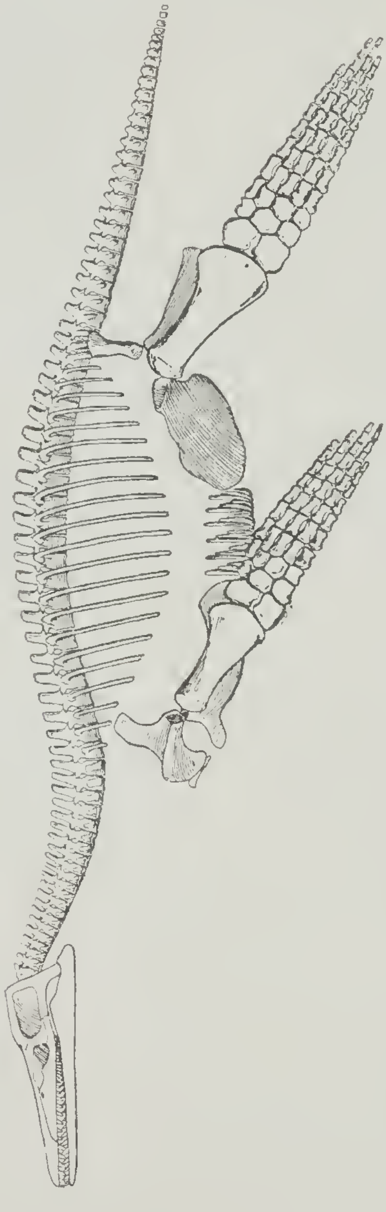
In his first description of *Plesiosaurus trochanterius*,[6] subsequently transferred to the genus *Pliosaurus*,[7] Richard Owen pointed out that the long

[5] 1871: John Phillips, Geology of Oxford, p. 362.

[6] 1839: R. Owen, Rep. Brit. Assn., p. 85.

[7] 1861: R. Owen, Mon. Foss. Rept., Kimmeridge Clay, p. 7.

bones of this gigantic Plesiosauroid species "deviate from the usual structure of the humerus and femur in that genus (*Plesiosaurus*) in having a strongly developed trochanterian ridge projecting from the outer side of the head of the bone: this process is of considerable breadth, stands well out from the surface at its upper part, then gradually subsides, and is lost in the upper third of the humerus" (p. 85).



Text-figure 5.—Restoration of the skeleton of *Peloneustes philarchus* (after C. W. Andrews).
($\frac{1}{21}$ natural size.)

The buttress-like process in these bones of *Kronosaurus,* whether interpreted as a trochanter or as a tuberosity, appears to have been more prominent than the corresponding structures in *Megalneusaurus, Pliosaurus,* or *Peloneustes.*

A pronounced depression on the postero-external surface of the longer specimen, below the buttress-like process, probably marks the insertion of powerful coraco-brachiales muscles, which pulled the humerus backwards and downwards.

The abraded surfaces are somewhat coarsely cancellous in appearance, and when viewed under a lens a curious irregular honeycombed effect is noticeable.

There are two fragments, over 200 mm. in length, in this series, which come from the distal end. These have been cleft in the median line of the main axis. Probably they represent the distal end of the same long bone, but since the initial cleavage so much abrasion has taken place that this cannot be positively stated. When placed in juxtaposition these two fragments present a distal end of about 400 mm. in antero-posterior width, with a maximum thickness of 134 mm. in the central region. In cross-section the bone is a flattened oval, and towards the anterior and posterior borders the thickness is much reduced. The articular area is fairly complete, but the fractures on the shaft are very irregular.

Embedded in a mass of matrix on the articular surface are the proximal remains of two bones, the radius and ulna, assuming the fragments to represent a humerus. Prolonged abrasion has so reduced these antebrachial elements that no useful information can be gained from them, but the ventral surface of the radius may have been very concave.

D. M. S. Watson in his interesting studies of the Elasmosaurid Shoulder-girdle and Forelimb,[8] and his reconstruction of the musculature from relatively well-preserved bones, points out that the Plesiosaur limb "is essentially a rigid oar." In the large-headed types with elongated humeri, the structure of the fore-limb and girdle provided the mechanism for swift movement in ocean waters. Watson suggests that these large-headed forms, with their enormous gape, fed on large animals which were captured by superior speed.

C. W. Andrews's restoration of the skeleton of *Peloneustes philarchus,* from his valuable Catalogue of the Marine Reptiles of the Oxford Clay, published by the British Museum, has been reproduced (Text-figure 5) to illustrate the general structure of a Pliosaur.[9]

ACKNOWLEDGMENTS.

I am indebted to Dr. Anderson, of the Australian Museum, Sydney, for a transcript of W. C. Knight's paper on *Megalneusaurus* from the American Journal of Science, and to Mrs. Estelle Thomson for her excellent drawings.

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[8] 1924: D. M. S. Watson, P.Z.S., p. 914.

[9] 1913: C. W. Andrews, Catal. Mar. Rept. Oxford Clay, pt. 2, Brit. Mus.